Solar Imaging Radio Array (SIRA)

Team Leader

John Martin

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Competition Sensitive

Results from IMDC Study, As Requested by Customer

- **Estimate cost**
  - Keep within the MIDEX cost cap, expected to be $240 Mil
  - MIDEX cost cap also includes launch vehicle, instruments and science program cost
- **Launch 16 satellites (target to launch 16, but no less than 12)**
  - Need at least 10 satellites operating and transmitting data to earth
- **Identification of orbit and insertion trajectory, with diagrams**
- **Conceptual design of satellite bus and Mission Operations**
  - Descriptions of subsystems
  - Diagrams of satellites in the launch vehicle and deployed
  - Concept of operations

This Study Focused on These Objectives

- **Cost, both by grassroots and parametric estimation**
- **Mission orbit and trajectory for achieving the orbit**
- **Major trade discussions**
  - Make the satellites sun-pointed and reposition for data downlink or make them earth-pointed with an articulated solar array
  - Methodology for downlinking data and total data volume that can be handled
  - Trajectory for achieving mission orbit
  - Use of solid rocket or bi-propellant for achieving mission orbit
  - Accuracy of pointing and after-the-fact knowledge
- **Conceptual design of bus and mission operations**
  - Used as basis for cost estimate
  - Show feasibility of the mission

SIRA Satellite Options

- **Orbit**
  - Earth-centered, Distant Retrograde Orbit having 500,000 km radius
  - Orbit inclined no more than 20° to the ecliptic
- **Baseline**
  - 3-axis stabilized
  - Fixed-mounted high gain antenna always faces earth
  - Articulated solar array
  - No reorienting satellite between data-taking and data-dump attitudes
- **Option 1**
  - 3-axis stabilized
  - Fixed-mounted high gain antenna
  - Fixed-mounted solar array
  - Satellite reorienting each day between data-taking and data-dump attitudes
- **Option 2**
  - Slow spinner (<5° per second, which is <0.8rpm)
  - Fixed-mounted antenna always pointing to earth (spin axis precesses once per 40 days)
  - Solar arrays on all available surfaces, with deployed and fixed panels as necessary to provide required power
  - No reorienting satellite between data-taking and data-dump attitudes

SIRA Presentation Format and Close-out Procedure

- **Summary of work in the "Final Presentation"**
  - Provided Thursday afternoon
- **Changes to material may be identified during the presentation**
  - GSFC will collect comments into a file "SIRA_Comments.ppt" and distribute to all presenters after the presentation
- **Preparation for final delivery**
  - Presenters will update files or provide additional information as required and put in the SIRA\Final_Report folder
  - Discipline Engineers who have additional Excel, Matlab, Ideas or other files to be included in the final delivery should make a folder having their discipline name within the Final_Report folder and include those files there
- **All presentation files included on Secure Download site (Presentation)**
- **Final files will be put on Secure Download site (Final_Report)**
- **Delivery CD-ROM (5 copies) will include "final" versions of presentation material and supporting analysis work.**

Study Details are Presented by Discipline Engineers

Integrated Mission Design Center

Time	Topic
1 : 00	Opening Remarks – John Martin
1 : 10	System Overview – Gabe Karpati
1 : 35	Flight Dynamics – Dave Folta
1 : 50	Mechanical – Dave Peters
2 : 05	Attitude Control – Jim Morrissey
2 : 20	Flight Software – Kequan Luu
2 : 35	Command and Data Handling – Terry Smith
2 : 50	Propulsion – Mark Underdown
3 : 05	Communications – Ron Vento
3 : 20	Power – Bob Beaman
3 : 35	Thermal – Dan Nguyen
3 : 50	Mission Operations – Jeff Hossler
4 : 05	Cost Analysis – Sanjay Verma
4 : 20	Closing Remarks and Wrap-up – John Martin
	Launch Vehicle – Larry Phillips (provided later)

Study Particulars

- **Name:**
  - Solar Imaging Radio Array (SIRA)
  - SIRA_Discipline.ext used for discipline file names
- **Dates:**
  - 25-28 August 2003
- **Customer Representatives at the IMDC:**
  - Bob MacDowall, GSFC, PI
  - Mike Kaiser, GSFC, Co-I
- **Participants:**
  - See the file SIRA_Attendance.xls